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Chapter 5. R&T Portfolio Project Requirements

5.1 Overview

5.1.1 R&T Portfolio Projects

5.1.1.1 This chapter describes the management of R&T Portfolio Projects, including both basic and applied research. The MDAA or MSOD may also decide to use this chapter to manage technology development in lieu of Chapter 4. It is expected that any large-scale development projects with a life-cycle cost exceeding $250M will be managed under Chapter 4 or NPR 7120.5, NASA Space Flight Program and Project Management Requirements. This chapter defines how NASA manages its R&T Portfolio Projects, not how it carries out the actual development of research or technology. Basic research addresses the need for knowledge, while applied research directs this new knowledge toward a practical application. Basic and applied research is directly tied to the Agency's vision and mission, as defined by NPD 1001.0, NASA Strategic Plan. The results of this research may expand the knowledge base, provide scientific and technological breakthroughs that are immediately applicable, or evolve into more advanced technology development. Research investigations are characterized by unpredictability of outcome, high risk, and funding usually at a fixed level on a yearly basis. The progress and relative value of such investigations are continually assessed, and the R&T is adjusted accordingly.

5.1.1.2 This chapter provides requirements for R&T Portfolio Projects and the portfolio cycle used within these projects. It is possible that the management structure used to manage R&T Portfolio Projects may have several variations, but the basic management organization and principles are the same. R&T Portfolio Projects may be managed under either programs or as Cross-Program Research (see section 3.5). For simplicity, this chapter uses the term Program Lead to refer to the responsible official of either the Program or the Cross-Program Research. When the MDAA or MSOD elects to collectively manage R&T Portfolio Projects as Cross-Program Research, the Research Director represents the "Program Lead," as specified in this chapter. Table 5.1.1 shows the mapping between the two terminologies.

5.1.1.3 The R&T Portfolio Project Lead shall support reviews required by the governing PMC (section 2.3.2), CMC (section 2.3.3), Strategic Acquisition Planning (section 2.2.3), and Special Independent Assessments (sections 3.4.3 and 5.2.5.6.2).

5.1.1.4 General management requirements applicable to all projects within a program, such as the Dissenting Opinions process (section 3.6) and Technical Authority process (section 3.7), are found in Chapter 3.

5.1.1.5 For R&T Portfolio Projects, the governing PMC and the DA for each KDP shall be as defined in Table 2.3.2 and Table 5.1.1.

	Program Lead Led	Research Director Led (Cross-Program Research)
Manager *R&T Portfolio Project (Figure 2.2.2) and Portfolio Cycle (Figure 2.2.3)*	R&T Portfolio Project Lead	R&T Portfolio Project Lead
Approving Official for Start *R&T Portfolio Project (Figure 2.2.2)*	MDAA (or MSOD)[1]	MDAA (or MSOD)[2]
DA for KDP A (approve FAD) R&T Portfolio Project (Figure 2.2.2)	MDAA (or MSOD)[1]	MDAA (or MSOD)[2]
DA for KDP B (per DA discretion) R&T Portfolio Project (Figure 2.2.2)	MDAA (or MSOD)[1]	MDAA (or MSOD)[2]
DA for KDP C (approve Project Plan) R&T Portfolio Project (Figure 2.2.2)	MDAA (or MSOD)1	MDAA (or MSOD)[2]
DA for KDP D (per DA discretion) R&T Portfolio Project (Figure 2.2.2)	MDAA (or MSOD)[1]	MDAA (or MSOD)[2]
DA for KDP E (per DA discretion) R&T Portfolio Project (Figure 2.2.2)	MDAA (or MSOD)[1]	MDAA (or MSOD)[2]
DA for KDP F (R&T transfer or closure) R&T Portfolio Project (Figure 2.2.2)	MDAA (or MSOD)[1]	MDAA (or MSOD)[2]
Selecting Official for Independent Assessment Team(s)	MDAA (or MSOD)[1]	MDAA (or MSOD)[2]
Governing PMC	MD PMC or MSO equivalent	MD PMC or MSO equivalent
Governing Document(s)	R&T Portfolio Project Plan and Program Plan	R&T Portfolio Project Plan and Cross-Program Research Plan

1 The MDAA or MSOD can delegate responsibility to the Program Lead.

2 The MDAA or MSOD can delegate responsibility to the Research Director.

The Program, Project, and Cross-Program Research Plans must reflect modifications due to the comments above and document the attendant rationale for the change.

Table 5.1.1 R&T Portfolio Project Management Structure

5.2 R&T Portfolio Project

5.2.1 Project Life Cycle

5.2.1.1 The life cycle of an R&T Portfolio Project follows a structured process that involves KDPs for assessing progress. An R&T Portfolio Project shall follow the life cycle in Figure 2.2.2, including the minimum set of reviews and gate products specified in this NPR.

5.2.2 Project Pre-Formulation

5.2.2.1 The Project DA is responsible for initiating a new R&T Portfolio Project (see Figure 2.2.2) by entering into a project's Pre-Formulation phase. The Project DA is responsible for ensuring the start of a new R&T Portfolio Project is in line with the Agency's vision and mission, as defined by NPD 1001.0, NASA Strategic Plan.

5.2.2.2 The Program Lead, in coordination with the MDAA or MSOD, shall assign an R&T Portfolio Project Lead, who is responsible for managing the R&T Portfolio Project.

5.2.2.2.1 If an R&T Portfolio Project Lead resides at a Center, the Program Lead shall coordinate the assignment of the R&T Portfolio Project Lead with the Center Director.

5.2.2.2.2 The Program Lead, in coordination with the MDAA or MSOD, should provide, in writing, a scope of the project to the R&T Portfolio Project Lead.

5.2.2.3 The R&T Portfolio Project Lead shall create an R&T Project FAD or an appendix to the Cross-Program Research Plan (see Appendix F), using the template in Appendix G. The R&T Project FAD is approved by the Project DA with concurrence by the Program Lead.

5.2.2.4 As a minimum, an R&T Project FAD shall:

a. Contain a statement of purpose for the proposed project and define its relationship to the Program's strategic goals and objectives.

b. Establish the scope of work to be accomplished.

c. Identify the R&T Portfolio Project Lead.

d. Identify the management process for the project.

e. Provide initial constraints, including resources, schedule and project participants within and external to NASA, including international partnerships.

f. Define the approach, resources, and reviews required to conduct project formulation.

g. Identify optional KDP B, if required by the DA, during Formulation or identify if optional KDP B is not needed.

5.2.2.5 KDP A (Figure 2.2.2) occurs when the Project DA approves the Project FAD, which initiates the R&T Portfolio Project's movement from Pre-Formulation into the Formulation phase of the life cycle.

5.2.3 Project Formulation

5.2.3.1 In the Formulation phase, R&T needs are identified, a scientific/technical approach is defined, if appropriate, the funding availability is determined, the funding mechanisms are established, the need to use the R&T Portfolio Project is identified, and management plans are developed/updated to reflect the use of the R&T Portfolio Project.

5.2.3.2 During Formulation, the R&T Portfolio Project Lead should develop a preliminary WBS, project schedule, and the allocation of resources to perform the project (see section 5.2.5.2 for later life cycle requirements). The project's preliminary WBS and associated WBS should be consistent with Appendix K. In coordination with the OCFO, the R&T Portfolio Project Lead should identify and establish a WBS Element (level 3 or lower) specifically for capital assets, when purchase of capital assets is required. In coordination with the OCFO, the R&T Portfolio Project Lead shall complete the Alternative Future Use (AFU) Questionnaire (Form NF 1739) if any NASA owned equipment purchased on the project has an acquisition value of $100,000 or greater per item, has an estimated useful life of two

years or more, and has a planned use on another project.

5.2.3.3 R&T Portfolio Project Plan

5.2.3.3.1 The R&T Portfolio Project Lead shall create the R&T Portfolio Project Plan or an appendix to the Cross-Program Research Plan (see Appendix F), using the template provided in Appendix I. The R&T Portfolio Project Plan is signed by the R&T Portfolio Project Lead and approved by the Project DA, with concurrence by the Program Lead. The R&T Portfolio Project Plan is used by the governing PMC in the review process to determine if the project is fulfilling its agreement.

5.2.3.3.2 As a minimum, an R&T Portfolio Project Plan shall:

a. State the area of specialty of the R&T Portfolio Project, the R&T Portfolio Project's objectives, and the relationship to the program objectives and goals.

b. Define a process for the solicitation, evaluation, and selection of proposals (including identifying Selection Official(s)) for competed portions of the R&T Portfolio Project. Note that this may be accomplished by referencing appropriate sections of standard R&T process documents, including the Guidebook for Proposers to NASA Research Announcements (http://www.hq.nasa.gov/office/procurement/nraguidebook) and any MD or MSO omnibus NASA Research Announcements (NRA) (e.g., Research Opportunities in Space and Earth Sciences (ROSES) or Research Opportunities in Aeronautics (ROA)).

c. Establish evaluation criteria, including considerations of technical merit, relevance to the Agency's vision and mission, as defined by NPD 1001.0, NASA Strategic Plan, and cost realism or reference existing documentation that defines this process. Describe how often reviews will be conducted and how the evaluation team will be formed.

d. Identify an integrated budget typically for three or five years, including appropriate WBS elements (see Appendix K) consistent with available R&T program resources.

e. Include a multi-year schedule for the R&T Portfolio Project.

f. Identify the R&T Portfolio Project Lead.

g. Identify a management and control structure to implement the R&T Portfolio Project.

h. Summarize the risk management approach to be used for the R&T Portfolio Project.

i. Define the project's resource requirements, including NASA personnel, facilities, and aircraft uses.

j. Define the specific reviews that will be conducted during the performance of the R&T Portfolio Project.

k. Document the project's approach to implementing IT security requirements in accordance with NPR 2810.1, Security of Information Technology.

l. Identify any optional KDPs (KDP B, D, and E) required by the DA.

5.2.3.3.3 If warranted by changes in the stated commitments or requirements, the R&T Portfolio Project Lead shall update the R&T Portfolio Project Plan. Each revised R&T Portfolio Project Plan is reviewed and approved using the same process as the original.

5.2.3.3.4 The R&T Portfolio Project Lead shall ensure the R&T Portfolio Project Plan and R&T Program Plan are consistent. If changes are required, the approval process for the applicable document(s) will be followed.

5.2.3.3.5 If the R&T Portfolio Project resides at one or more Centers, the R&T Portfolio Project Lead shall add the Center Director(s) or his/her designee(s) responsible for committing workforce and facilities as concurrence signature(s) to the R&T Portfolio Project Plan.

5.2.3.3.6 During Pre-Formulation or Formulation, the Project DA may request a preliminary R&T Portfolio Project Plan from the R&T Portfolio Project Lead to document an agreement between project and program regarding the objectives and approach prior to full project approval.

5.2.3.4 The Project DA shall determine if the optional KDP (KDP B) is required during Formulation or if the optional KDP (KDP B) is not needed. This optional KDP is added at the Project DA's discretion and identified in the Project FAD. If the KDP B is required, the Project DA should determine the gate products required prior to this optional KDP.

5.2.3.5 Prior to KDP C, a Formulation Review shall be conducted. The Formulation Review has both an internal and external component. The internal component is a project review to ensure the project is ready to proceed to KDP C. The external component is an independent assessment and is optional per DA discretion. The selecting official identified in Table 2.3.2 assigns the IA to be performed by one or more organizations. The selecting official for the Formulation Review team (see Table 2.3.2) is responsible for the development and approval of the ToR for the Formulation Review. Conflicts during ToR development should be resolved in accordance with section 3.6.

5.2.3.6 For R&T Portfolio Projects proposing the construction of new or modification to existing NASA owned

facilities using CoF funding, the R&T Portfolio Project Lead shall complete a preliminary business case analysis, in accordance with NPD 8820.2, Design and Construction of Facilities and NPR 8820.2, Facility Project Implementation Guide. A business case guide can be located at http://www.hq.nasa.gov/office/codej/codejx/codejx.html.

5.2.3.7 For R&T Portfolio Projects proposing the acquisition of new aircraft, the R&T Portfolio Project Lead shall plan and perform these acquisitions, in accordance with NPR 7900.3, NASA Aircraft Operations Management. The term aircraft includes both piloted and unmanned aerial vehicles.

5.2.3.8 The R&T Portfolio Project Lead shall ensure that proposals and plans for subordinate activities/tasks include documentation of (a) environmental compliance and permit considerations and (b) NEPA evaluation.

5.2.3.9 If an R&T Portfolio Project contains elements that include hardware used for flight (piloted or unpiloted), flight control software, wind tunnel testing, or systems that could result in potential harm to personnel or property, the R&T Portfolio Project Lead shall ensure a Safety and Mission Assurance (SMA) plan is developed. The plan identifies and documents project element-specific SMA roles, responsibilities, and relationships, with appropriate Headquarters and/or Center- SMA organizations. The plan should reflect the SMA role in areas such as: procurement, management, design and engineering, design verification and test, software design, software verification and test, manufacturing, manufacturing verification and test, operations, and pre-flight verification and test. In many cases, these plans are already established by Center and/or facility procedures for operations such as wind tunnel tests and flight testing and do not need to be developed by the project. The R&T Portfolio Project Plan should be used to document when project elements or other entities will need to develop unique SMA plans. However, these plans should still be stand-alone documents.

5.2.3.10 If an R&T Portfolio Project contains elements that include hardware used for flight (piloted or unpiloted), flight control software, wind tunnel testing, or systems that could result in potential harm to personnel or property, the R&T Portfolio Project Lead shall ensure a risk management plan is developed. In many cases, these plans are already established by Center and/or facility procedures for operations such as wind tunnel tests and flight testing and do not need to be developed by the project.

5.2.3.11 If a risk management plan does not already exist for a project element containing hardware used for flight (piloted or unpiloted), flight control software, wind tunnel testing, or systems that could result in potential harm to personnel or property, the R&T Portfolio Project Lead shall ensure a stand-alone risk management plan is developed that includes the content shown in NPR 8000.4, Risk Management Procedural Requirements. The R&T Portfolio Project Plan should be used to document when unique risk plans need to be developed for project elements because existing plans are not sufficient or when no plan exists. However, these plans should still be stand-alone documents.

5.2.4 Project Approval

5.2.4.1 The Project DA has the authority to move an R&T Portfolio Project from the Formulation phase to the Implementation phase (KDP C). KDP C (Figure 2.2.2) occurs when the Project DA approves the R&T Portfolio Project Plan. The Project DA is responsible for ensuring the R&T Portfolio Project is in line with the Agency's vision and mission, as defined by NPD 1001.0, NASA Strategic Plan.

5.2.5 Project Implementation

5.2.5.1 In the Implementation phase, the R&T Portfolio Project Lead executes the R&T Portfolio Project Plan, which usually consists of one or more portfolio cycles (see section 5.2.5.7).

5.2.5.2 Use of accepted project management principles will increase the likelihood that the R&T Portfolio Project will be successful in achieving its technical objectives within cost and schedule constraints. At a minimum, the R&T Portfolio Project Lead shall establish a WBS, in accordance with Appendix K, a project schedule with milestones for each element in the WBS, and an allocation of the project's available resources necessary to achieve each milestone (see section 5.2.3.2 for preliminary requirements). The milestones should be chosen at intervals sufficient to demonstrate steady progress.

5.2.5.3 An R&T Portfolio Project Lead shall track progress against a baseline plan. The WBS, the project schedule, and the allocation of resources to milestones constitute the baseline plan for assessing technical, schedule, and cost performance. Note that it is not uncommon to re-baseline R&T Portfolio Projects due to the uncertain nature of research. It is possible that this may occur as a result of periodic assessments.

5.2.5.4 The Project DA shall determine if optional KDPs (KDP D and E) are required during Implementation or if the optional KDPs (KDP D and E) are not needed. These optional KDPs are added at the Project DA's discretion and identified in the Project FAD. If these optional KDPs are required, the Project DA should determine the gate products required prior to these optional KDPs.

5.2.5.5 R&T Portfolio Project Status Reviews.

5.2.5.5.1 The R&T Portfolio Project Lead shall conduct R&T Portfolio Project status reviews annually to assess

progress towards the R&T Portfolio Projects goals and for NASA officials to gain better insight into the R&T work being performed. The R&T Portfolio Project status reviews are also utilized by the Program Lead and R&T Portfolio Project Lead to decide whether the R&T Portfolio Project should be continued for another year or transferred/closed for lack of sufficient progress (see section 5.2.6.1). These reviews can also be called by the MDAA, MSOD, or Program Lead at any time to determine the need to modify or end the project. The R&T Portfolio Project status reviews and the R&T Portfolio Cycle status reviews (see section 5.2.5.7.4) may be combined per R&T Portfolio Project Lead direction.

5.2.5.6 Independent Assessments.

5.2.5.6.1 Independent Assessments (IAs) occur as part of the R&T Portfolio Project life cycle. IAs during Implementation are performed periodically and should be documented in the R&T Portfolio Project Plan. These IAs may occur as part of the normal peer review process within the Portfolio Cycle. The selection official for independent assessment team(s) is defined in Table 2.3.2. The selecting official for the independent assessment team (see Table 2.3.2) is responsible for the development and approval of the ToR for the IA. Conflicts during ToR development should be resolved, in accordance with section 3.6. The ToR for peer reviews are developed in accordance with NPR 1080.1, NASA Science Management, and do not need to be redeveloped as described above.

5.2.5.6.2 The NASA AA, MDAA, MSOD, AA for PA&E, Program Lead, or Research Director may authorize special independent assessments at any time in an R&T Portfolio Project's life cycle. A ToR should be developed for each special independent assessment. The ToR should be developed by the individual(s) who authorizes the special independent assessment in coordination with the MDAA or MSOD (or designee). Conflicts during ToR development shall be resolved in accordance with section 3.6.

5.2.5.7 Portfolio Cycle.

5.2.5.7.1 Each R&T Portfolio Project performs a process where R&T investigations are formulated, evaluated, approved, funded, implemented, and closed. This NPR refers to this process as the Portfolio Cycle and Figure 2.2.3 is used as a guide to establish this process. This process is referred to as a cycle, because typically only a portion of the R&T investigations under an R&T Portfolio Project go through this process at once and R&T Portfolio Projects perform this process on a cyclical basis; sometimes annually, when they solicit external R&T investigations through a Broad Agency Announcement (BAA) or some other vehicle. It is also typical for the R&T Portfolio Projects to perform a similar Portfolio Cycle on a cyclical basis to fund R&T internal to NASA. Some R&T Portfolio Projects combine the solicitation of internal and external R&T into a single Portfolio Cycle process.

5.2.5.7.2 The R&T Portfolio Project Lead should ensure that a process is in place to track and manage each Portfolio Cycle. The R&T Portfolio Project Plan defines the process to manage the Portfolio Cycle or reference to other Agency or Mission Directorate-specific document(s) that provides this information.

5.2.5.7.3 The R&T Portfolio Project Lead should ensure that the Portfolio Cycle includes sufficient reviews and assessments in formulation to ensure that a balanced and well constructed group of R&T investigations is developed. The R&T Portfolio Project Lead should solicit and select competed R&T investigations in accordance with NPR 1080.1, NASA Science Management. A key component to selecting competed investigations is the peer review of proposals, as described in NPR 1080.1, NASA Science Management. The R&T Portfolio Project Lead should also ensure compliance with NPR 5100.4, Federal Acquisition Regulation Supplement (NASA/FAR Supplement) (special attention should be given to NPR 5100.4, Part 1835 and 1872) and NPR 5800.1, Grant and Cooperative Agreement Handbook, as applicable.

5.2.5.7.4 Status reviews (see Figure 2.2.3) typically occur annually during Portfolio Cycle implementation through the review of each group of R&T investigations and the progress reports submitted by the selected investigators. The status reviews are utilized by the Program Lead and R&T Portfolio Project Lead to decide whether each R&T investigation should be continued for another year or transferred/closed for lack of sufficient progress. The status reviews are used to:

a. Determine changes in scope that effect subsequent solicitations.

b. Provide information to support evaluation of performance, as specified in the R&T Portfolio Project Plan, R&T Program Plan, or Cross-Program Research Plan.

c. Determine if the results of any of the R&T investigations are ready to be transitioned to another project or to an organization outside the Agency.

d. Determine if any of the R&T investigations should be terminated.

5.2.5.7.5 Prior to the decision to terminate a contract or multiyear grant prior to completion of the terms of the document, the R&T Portfolio Project Lead should consult with the Contracting/Procurement Officer to understand the full legal and cost ramifications.

5.2.5.7.6 The status of publication of R&T investigations should be reported to the Project Lead on an annual basis. The R&T Portfolio Project Lead should ensure investigators are encouraged to publish the results of R&T

investigations. The R&T Portfolio Project Lead should ensure that NASA investigators publish or disseminate the results of NASA R&T activities according to the data dissemination plans documented in the Program and Project Plans.

5.2.5.7.7 The R&T Portfolio Project Lead should ensure investigators submit final reports for investigations funded through grants and contracts, and ensure that final reports are archived in the NASA Scientific and Technical Information System, as specified in NPR 2200.2, Requirements for Documentation, Approval, and Dissemination of NASA Scientific and Technical Information.

5.2.6 R&T Portfolio Project Transition/Closure

5.2.6.1 R&T Portfolio Project status reviews (see section 5.2.5.5) are utilized by the Program Lead and R&T Portfolio Project Lead to recommend whether the R&T Portfolio Project should be continued for another year or discontinued. In addition, status reviews may be called by the MDAA, MSOD, or Program Lead at any time to determine the need to modify or end the R&T Portfolio Project. KDP F (Figure 2.2.2) occurs when the Project DA decides to transition the R&T to a different project or discontinue the R&T Portfolio Project. KDP F initiates the R&T Portfolio Project's movement from Implementation into the Transition/Closure phase of the life cycle.

5.2.6.2 In the R&T Portfolio Project Transition/Closure Phase, the results of R&T investigations are published and archived or transitioned to another project, and the investigations are then closed out. The R&T Portfolio Project Lead shall document lessons learned, in accordance with NPR 7120.6, Lessons Learned Process.

5.3 Requirements Flow Down for Project Elements

5.3.1 Portions or elements of R&T Portfolio Projects may be accomplished at different Centers. The R&T Portfolio Project Lead shall flow down requirements for this work sufficiently to ensure requirements are met at the R&T Portfolio Project level.

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